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TABLE IV.—*Influenza case reports. Number of cases of influenza occurring in various States as reported to the Public Health Service by State health departments.*

[States omitted are those from which no reports have been received. Blank spaces indicate that no report was received for the week. These reports are preliminary and subject to change.]

State.	Cases reported week ended—								
	January.		February.				March.		
	24	31	7	14	21	28	6	13	20
Alabama.....	8	203	1,296	3,235	2,366	3,603	3,885	1,047	829
Arkansas.....	179	595	5,666	6,599	2,793	1,690	2,576	2,055	835
California.....	1,604	7,133	13,660	11,887	7,420	5,527	918	495	582
Connecticut.....	1,123	4,664	5,666	4,868	2,771	1,183	571	229	121
Delaware.....	5	21	88	78	43	36	50	33	13
District of Columbia.....	1,216	1,616	557	298	104	36	21	6	6
Florida.....	484	1,547	1,581	1,735	1,420	1,026	580	413	298
Georgia.....	95	617	3,256	5,411	7,809	8,210	3,677	3,087	2,066
Idaho.....	922	2,783	2,394	.....	.....	.....	.....	.....	.....
Illinois.....	14,805	29,156	30,330	23,037	7,237	3,052	1,344	453	430
Indiana.....	1,714	.....	7,811	7,503	3,904	2,038	1,289	1,184	412
Iowa.....	644	3,960	5,070	1,981	889	170	83	96	22
Kansas.....	1,130	8,582	16,960	17,699	10,026	3,590	3,332	1,551	1,290
Kentucky.....	170	878	2,536	6,067	4,295	8,584	4,039	3,640	.....
Louisiana.....	123	763	1,901	3,690	3,153	3,363	2,541	1,982	1,045
Maine.....	.....	387	936	3,942	3,702	2,134	1,130	1,105	848
Maryland.....	.....	.....	4,935	8,942	4,758	3,184	2,052	1,203	747
Massachusetts.....	489	4,475	9,730	10,727	5,601	2,576	1,144	490	254
Michigan.....	.....	.....	14,201	13,470	6,672	3,881	.....	.....	.....
Minnesota.....	.....	5,775	11,397	7,555	1,213	1,447	692	406	130
Mississippi.....	.....	.....	2,761	4,014	3,332	2,475	2,179	2,230	.....
Missouri.....	.....	4,043	5,359	1,695	466	.....	.....	.....	.....
Montana.....	67	1,022	1,847	1,650	1,400	348	514	206	82
Nebraska.....	154	1,815	3,998	6,048	3,272	2,492	2,007	834	849
New Hampshire.....	.....	382	460	701	383	488	.....	.....	.....
New Jersey.....	753	7,365	9,603	5,807	2,798	1,043	764	365	171
New Mexico.....	61	260	1,576	1,166	632	204	186	97	90
New York (exclusive of New York City).....	555	4,755	11,616	13,259	11,304	5,330	4,030	2,434	1,081
New York City.....	5,690	30,456	21,388	8,091	3,030	1,069	489	381	230
North Carolina.....	.....	3,356	12,892	23,571	18,439	8,398	3,800	1,605	.....
North Dakota.....	.....	.....	946	497	178	.....	.....	.....	.....
Ohio.....	.....	.....	10,479	.....	.....	.....	.....	.....	.....
Oregon.....	.....	.....	1,042	1,318	1,971	2,495	2,309	.....	.....
Pennsylvania.....	.....	.....	16,090	13,324	9,365	2,123	.....	.....	.....
South Carolina.....	.....	1,661	3,179	3,916	2,846	1,716	971	678	523
South Dakota.....	118	.....	5,042	4,976	3,047	1,649	495	120	267
Tennessee.....	.....	.....	2,331	2,432	.....	.....	.....	.....	.....
Texas.....	.....	.....	11,265	6,788	1,035	588	134	55	.....
Utah.....	.....	.....	1,489	228	96	.....	.....	.....	.....
Vermont.....	25	89	272	795	1,314	1,071	481	470	158
Virginia.....	.....	3,097	6,318	2,934	1,512	1,073	.....	.....	.....
Washington.....	12	902	6,451	6,426	4,595	1,559	1,260	271	93
West Virginia.....	.....	1,667	4,732	6,308	1,848	780	.....	.....	.....
Wisconsin.....	1,944	6,739	14,328	10,310	6,274	3,131	994	554	503
Wyoming.....	.....	1,372	.....	.....	.....	.....	.....	.....	.....
Total.....	34,090	142,136	295,433	265,981	158,294	90,752	48,219	29,779	13,975
Number of States reporting.....	25	32	43	41	40	37	32	31	27

<sup>1</sup> Week ended Friday.<sup>2</sup> Five days only.<sup>3</sup> Six days only.

## OCCUPATION IN RELATION TO TUBERCULOSIS.

By GEORGE M. KOBER, M. D., LL. D., Professor of Hygiene, Georgetown University, Washington, D. C.

Health is the chief asset of the workingman, and no greater calamity can befall him than to have his earning capacity impaired or arrested by reason of sickness or disability; it means in many instances the utter financial ruin of the family, and is doubtless one of the most potent causes of poverty and distress.

In the search for the causes and prevention of diseases, the interests of the wage earners have not been neglected; indeed it may be truly said that a special department has been created known as Industrial Medicine and Hygiene, with a very creditable, but by no means complete, literature of its own.

The necessity for devoting special attention to this subject was shown long ago by observations made by Hippocrates and Galen, that certain occupations and trades, even in those primitive periods, were dangerous to health. These and subsequent authors refer in their writings to occupational diseases of miners, bearers of burdens, messengers, sailors, soldiers, chemists, and professional men. The first systematic treatise on diseases of occupation was written by Prof. Bernardo Ramazzini, of Padua. His monograph, *De Morbis Artificum Diatriba*, published in 1700, was translated into English in 1705, and into French in 1711, and awakened a deep interest in England and France and also in Germany.

Diseases of occupation are everywhere assuming more and more importance, not only to wage earners and employers, but also to physicians, who, in order to make an early diagnosis and give the patient the full benefit of treatment, should know the conditions injurious to health under which our fellow men and women live and work. In countries and States where reports of certain occupational diseases are compulsory, it is quite possible to secure fairly reliable data as to the number of cases of specific industrial poisoning.

The same may be said of the facilities afforded by the statistics of the German industrial insurance institutes, which furnish not only the number of deaths but also the number of cases treated, together with the age period and the duration of the disease. Similar facts, together with the results of highly specialized investigations, are now being collected and published in gratifyingly increasing numbers by Federal and State Governments.<sup>1</sup>

Such special investigations are all the more important when it is remembered that even the most complete statistics fail to reveal all the factors which influence the health and longevity of operatives. Great differences are found in the conditions under which the work is performed, some of which are entirely avoidable, while others are not, and it is hardly fair to characterize certain trades as dangerous when experience has shown that no harm results when proper safeguards have been taken. In the consideration of this question, the personal element of the workmen, their habits, mode of life, etc., can not be ignored. Many persons are engaged in occupations for which they are not physically fitted, and others ruin their health

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<sup>1</sup> It is interesting to note that the first investigation by the Federal Government was made in Philadelphia in 1902 at the request of Hon. Carroll D. Wright, by my former student, Dr. C. F. W. Doehring. The result of his investigation in the manufacture of white lead, linoleum, fertilizers, etc., were published in 1903 in *Bulletin 44*, under the title of "Factory sanitation and labor protection."

by vice, dissipation, improper food, and insanitary home environments. There are also a number of occupations in which the alcohol habit prevails to an unusual extent, perhaps because of the character of the work, perhaps as the result of association, and so it would not be fair to attribute the ill health of the operatives altogether to the character of the employment. In addition to all this, there are factors, such as malaria, water and soil pollution, and especially hookworm infection, for which neither the industry, employer, nor employee is primarily to blame.

All this emphasizes the need of a thorough study of existing conditions, in order not only to determine the relative health risks, but also to formulate rules which may remove the causes or render the system better fitted to resist them. It is largely a public-health problem, and in this, as in all preventive efforts, a hearty cooperation is absolutely essential. In this instance the responsibility rests with the State, the employer, the employee, and the physician; each has certain duties to perform, and the help of all is necessary for the removal or mitigation of existing ills.

As a result of numerous independent investigations it is known today that persons habitually engaged in hard work, especially in factories and indoors, present a greater amount of sickness and a higher mortality than persons more favorably situated, and that the character of the occupation influences to a great extent not only the average expectation of life but also the prevalence of certain diseases.

#### **Etiology of Tuberculosis.**

From our knowledge of the etiology of tuberculosis, we know that while the tubercle bacilli are not ubiquitous, they are at least widely scattered and the modes of invasion are numerous, and yet there is a large proportion of those persons exposed to infection who do not develop the disease. This shows that in addition to the germ there must also be a suitable soil for the development of pathogenic effects. Such a soil is usually found in persons of feeble physique, victims of malnutrition, whose bodies have been weakened from any one or more of the numerous causes which are afloat,—a previous attack of sickness, hurry, worry, chronic fatigue, loss of sleep, vice, and dissipation, insufficient and improper food, insanitary homes, lack of pure air, etc.

Clinical experience indicates that faulty nutrition,<sup>1</sup> debility, loss of blood, anemia, mental anxiety, diabetes, whooping cough, measles, alcoholism, and many other diseases favor the development of tuberculosis.

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<sup>1</sup> The influence of an inadequate food supply is shown by the fact that the mortality rate from tuberculosis in Germany is as high now as it was in the early eighties, all the gains having been wiped out because of lack of sufficient food, and the consequent diminished resisting power of the system.

We also know that a predisposition may be inherited, as evidenced by a delicate physique, narrow chest, and general vulnerability of the tissues.

A vulnerability of the tissues may also be acquired by indoor life and dusty occupations, especially when the work involves exposure to dampness, extremes of heat and cold, sudden changes in temperature, and last but not least, exposure to industrial poisons.

#### **Danger of Indoor Life and Occupations.**

I am not disposed to overrate the dangers of indoor life and occupations. Indeed there may be no danger at all so far as the air is concerned, if steps have been taken for the removal of impure and the introduction of pure air. If, however, these precautions are neglected, there is every reason to assume that the habitual inhalation of air vitiated by dust, the products of respiration, combustion, and decomposition, and by the possible presence of toxic fumes and gases, plays an important rôle in the causation of respiratory diseases. All the injurious effects are intensified when human beings are obliged to occupy rooms with an air supply insufficient for the proper oxygenation of the blood, and also when, because of inadequate floor space, contact infections are more frequent. As a result of these adverse conditions we note an undue prevalence of consumption, pneumonia, and septic sore throat in crowded workshops, dwellings, prisons, and, formerly, also in military barracks and on battleships. The influence of overcrowding on disease of the air passages, amounting at times to epidemics, was well illustrated on the Isthmus of Panama and, as suggested by Gen. Gorgas, accounts probably for the undue prevalence of the diseases among the gold miners of the Transvaal. By moving the laborers on the Isthmus from large crowded barracks into single huts and rooms with not less than 50 square feet of floor space, the pneumonia rate was reduced in one year from 18.4 to 2 per 1,000.

Other bad effects in many indoor occupations result because the work is often performed by the worker while in a stooped position. The effects of such conditions of work are especially harmful to youthful workers whose osseous system is not fully developed. Among the more important harmful results should be mentioned the hollow chest and round, stooped shoulders, as seen in tailors, engravers, lithographers, jewelers, watchmakers, metal grinders, shoemakers, and all others obliged to assume a more or less bent-over position.

All thoracic postural deformities naturally interfere with free expansion of the lungs and, hence, with the respiratory functions, and also cause constipation, congestion of the portal circulation, and hemorrhoids. Many of the deformities, it is true, have been acquired

in the school, but they should be remedied in the workshop by adjustable seats, prompt correction of faulty positions, and well-regulated gymnastic exercises, especially of opposing groups of muscles.

The latest occupational mortality statistics for the United States for 1909 show that the mortality from tuberculosis in agricultural pursuits was 8.7 per cent; among bookkeepers and accountants, 22.5 per cent; and in servants and waiters, 27.4 per cent. If we stop right here the evidence would be overwhelming in favor of outdoor employment. But when we find that the tuberculosis mortality in Government officials and bankers is less than 8.7 per cent, and that for draymen, hackmen, and teamsters it is 23.4 per cent, it becomes apparent that in estimating the hazards of indoor occupations, other factors, such as physique, habits, exposure to dust, social conditions, and standards of living, must be considered.

#### Dusty Occupations.

Hoffman<sup>1</sup> estimates that of the 44,130,000 American wage earners of both sexes, approximately 4,000,000 work under conditions more or less detrimental to health, on account of the presence of an excess of atmospheric impurities predisposing to or accelerating the relative frequency of tuberculous and nontuberculous respiratory diseases, and he submits the following table:<sup>2</sup>

Trade group.	Males.		Females.	
	Number.	Per cent.	Number.	Per cent.
Metallic dust.....	258,454	7.6	33,255	4.9
Mineral dust.....	514,693	15.8	15,332	2.3
Mineral industries.....	844,897	25.9	550	.1
Vegetable fiber dust.....	336,323	10.3	206,135	44.0
Animal and mixed fiber dust.....	189,937	5.6	149,262	22.2
Organic dust.....	331,911	16.3	177,545	26.4
Mixed organic and inorganic (public) dusts.....	594,285	18.2	1,399	.2
Total.....	3,264,500	100.0	673,478	100.0

The dust which we inhale is, fortunately, largely arrested in the upper air passages, especially in the nostrils, and in case of mouth breathers also in the buccal cavity. In an ordinary way the dust arrested in the nose, unless ejected by sneezing, mixes with the mucus, and after reaching the throat, also with the saliva, and is unconsciously swallowed. Only a small amount of the dust actually reaches the lungs. Saito,<sup>3</sup> working in Lehmanns's Laboratory, located from 4 to 24 per cent of the total amount of white-lead dust in the respiratory organs, and the remainder in the digestive tract.

<sup>1</sup> Hoffman, Frederick L., *Mortality from Respiratory Diseases in Dusty Trades*: U. S. Department of Labor, Bureau of Labor Statistics, No. 231, June, 1918. On pages 46-50, the lists of occupations representing the various dusty-trade groups are given, and offer material for serious reflection.

<sup>2</sup> Compiled from the report of the Bureau of the Census on occupational statistics, 1910.

<sup>3</sup> Saito Yoichiro Dr., *Experimentelle Untersuchungen über die quantitative Absorption von Staub*: Arch. f. Hyg., München u. Leipz. Bd. LXXV,

Nature has provided numerous safeguards to prevent the lodgment of dust in the lungs (such as sneezing, coughing) and in the ciliated epithelial cells of the trachea; but when as a result of long-continued exposure this protective influence is diminished or ceases, dust will reach the air vesicles and produce mischief.

In Laborde's experiments with guinea pigs exposed to the inhalation of fine white-lead dust, the animals died within two hours. In the lungs were found intense congestion and ecchymoses. When the exposure was less intense and the animals lived longer, similar but less profound vascular changes were found in the lungs, pointing to direct irritation from the dust. Under ordinary circumstances and with limited quantities of soluble dust, the epithelial motile cells endeavor to protect the lungs once more by taking up the fine dust particles and transporting them through the lymphatics into the bronchial glands. When, however, the amount of dust is beyond their capacity, or its character is of a certain nature, it acts as a foreign body, causing an irritation, which is followed by a catarrh and the more serious chronic reactive inflammations of the respiratory organs so common among persons engaged in dusty occupations. The chronic inflammatory conditions thus produced are generally known as "pulmonary fibrosis."

The degree of injury to the respiratory organs depends upon the character of the individual particles of dust and their chemical composition. It is generally admitted that the sharp, angular, and nonabsorbable particles of metallic and also of mineral dust, especially dust containing silica, are much more apt to produce an intensive irritation, and even actual abrasions, than organic dust; hence it is reasonable to assume that they may thus favor invasion of bacilli or lighting up inactive lesions.

It is also doubtless true, as pointed out by Collis,<sup>1</sup> that dusts are more injurious if they differ in their chemical composition from the elements of which the body is normally composed. This may account for the fact that lime dust, in spite of its angular form, and plaster of Paris, with its more or less acute angles, and also cement dust, are comparatively innocuous.

Nieszytka<sup>2</sup> reports that while 76.5 per cent of all the deaths among the sandstone workers in Hanover are caused by tuberculosis, according to Grab's statistics, tuberculosis in limestone workers is the cause of death in only 7.5 per cent of the total mortality.

Koelsch<sup>3</sup> confirms Grab's statistics with reference to the lime and cement industry, and adduces evidence to show that among 400 workers in a German plaster of Paris establishment, no cases of tuberculosis occurred during a period of 17 years, and that of 40,824 deaths

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<sup>1</sup>Collis, International Med. Congress, London, 1913.

<sup>2</sup>Nieszytka: *Vrtljschr. f. gerichtl. Med.*, Berl. 1912. XLIII supp. Heft 1, 2, p. 143.

<sup>3</sup>Koelsch: *Krankheit u. Sociale Lage*. Erst. Leipz. u. München.

from tuberculosis, analyzed by Fisac, in Spain, only 17, or 0.41 per cent, occurred in lime or gypsum workers. Selkirk,<sup>1</sup> of our own country, was also unable to find a single case of phthisis among lime workers, nor could he learn of any worker in lime kilns having died from this disease.

It is generally admitted that only the finest particles of dust, regardless of its source, gain access to the lungs, and that the volume of dust and intensity and duration of exposure play an important rôle in the degree of injury inflicted.

*Municipal dust.*—I have analyzed the original tabulation by the Prudential Insurance Co. of America based upon its industrial experience from 1907 to 1912, and find that 10,567 deaths occurred in individuals exposed to municipal dust. This group includes street cleaners, drivers, draymen, teamsters, coachmen, street-car conductors and street-car motormen. The proportionate mortality from consumption is 23.8 per cent, and from other respiratory diseases, 11.8 per cent, at ages of 15 or over. But when we find that the mortality from consumption in the street cleaners is only 12.9 per cent compared with 25 per cent in street-car conductors and motormen, and 33 per cent in coachmen, we are forced to the conclusion that other factors besides the element of dust have to be considered.

*General organic dust.*—In the same study we find that 5,694 deaths occurred in workers exposed to general organic dust. This group includes bakers, candy makers, flour millers, glove makers, harness makers, belt and pocketbook makers, shoe-factory workers, tannery finishers, button makers, cigar makers, tobacco workers, comb makers, and grain handlers. The proportionate mortality from pulmonary tuberculosis is 24.9 per cent and from other respiratory diseases 11.3 per cent. Here again we have reason to inquire how to account for the difference between 23.3 per cent in bakers and 37.2 in tannery finishers, or 36.1 per cent in cigar makers.

*Vegetable fiber dust.*—Another study deals with 1,120 deceased workers at ages of 15 and over, who were exposed to the inhalation of vegetable fiber dust. This group includes furniture finishers and sanders, woodwork finishers, cotton spinners, knitting-mill employees, lace, linen, flax, and other weavers, paper cutters and rope makers. The proportionate mortality from pulmonary tuberculosis is 29.1 per cent and from other respiratory diseases 11.1 per cent. Here again we observe great differences in the percentage of 22.1 from consumption in knitting-mill employees, against 49.2 per cent in lace weavers.

*Animal and mixed fiber dust.*—Study No. 4 deals with 1,276 deceased workers who were exposed to animal and mixed fiber dust. The occupations included in this group are hatters, upholsterers,

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<sup>1</sup> Selkirk: J. Am. M. Assn., December 12, 1908.



carpet weavers and workers, silk weavers, woolen-mill employees, fur workers and mattress workers. The proportionate mortality from pulmonary tuberculosis is 29.1 per cent and from other respiratory diseases 11.1 per cent, exactly the same as for vegetable-fiber dust.

*Mineral dust.*—Study No. 5 refers to 3,734 deceased workers who were exposed to mineral dust. The occupations included are potters, tile makers, glass blowers and cutters, marble and stone cleaners, cutters and polishers, core makers, molders, lapidaries, lithographers, paper hangers, and plasterers.

The proportionate mortality from pulmonary tuberculosis is 25.9 per cent and from other respiratory diseases 14 per cent. It is important to note that the percentage of deaths from pulmonary tuberculosis, contrary to expectations, is 3.2 per cent less than in the two preceding groups, which were exposed to vegetable dust, and animal and mixed fiber dust, although the percentage of deaths from other respiratory diseases is 3 per cent greater than in all other groups.

*Metallic dust.*—Study No. 6 refers to 3,374 deceased workers, who were exposed to metallic dust. The occupations included are grinders, polishers, cutlery, file and tool workers, brass molders and finishers, gold beaters, jewelers, gold and silver polishers, type founders, engravers, printers, and pressmen. The proportionate mortality from pulmonary tuberculosis in this group is 30.3 per cent and from other respiratory diseases 11.1 per cent.

*Recapitulation.*

Dust exposed to.	Number of workers.	Proportionate mortality from—	
		Pulmonary tuberculosis.	Other respiratory diseases.
		<i>Per cent.</i>	<i>Per cent.</i>
Metallic dust.....	3,374	30.3	11.1
Animal and mixed fiber dust.....	1,276	29.1	11.1
Vegetable fiber dust.....	1,120	29.1	11.1
Mineral dust.....	3,734	25.9	14.0
General organic dust.....	5,694	24.9	11.3
Municipal dust.....	10,567	23.8	11.8

The foregoing data undoubtedly point to the fact that exposure to all kinds of dust plays a very important rôle in the causation of respiratory diseases. Dust containing crystalline silica, such as quartz, quartzite (ganister, buhr-stone), flint, sandstone, carborundum, and emery is perhaps the most frequent cause of the more acute forms of fibrosis. It is possible that even in what is commonly called metallic dust the siliceous particles from grinding and polishing implements, are, with the possible exception of the red oxide of iron, chiefly

responsible for the cases of siderosis. All other kinds of dust, however, may, and doubtless frequently do, produce a milder grade of pneumoconiosis and fibrosis.

Whether or not the lesions thus produced may eventuate in pulmonary tuberculosis depends probably upon a number of factors, the most important of which is the presence of tubercle bacilli. Watkins-Pitchford cited by Landis<sup>1</sup> found tubercle bacilli in 15.2 per cent of samples of sputa collected underground in the Transvaal gold mines, as against 2.5 per cent of sputa collected in the homes and places of resort of the workers. Similar investigations in other industries may bring us nearer the truth; but after all, the danger from droplet infection, the common drinking cup, including the whisky flask, which formerly in the spirit of good fellowship was not infrequently passed from mouth to mouth, and the question of massive infection can not be underrated.

In the light of our knowledge concerning infection in early childhood, it is perfectly conceivable that the germs of tuberculosis may remain dormant because of the formation of fibroid tissue, and that the same factors which determine the development of an acute or chronic form of tuberculosis and the reactivation in apparently arrested cases of pulmonary tuberculosis have to be considered. Many of the general predisposing causes calculated to diminish the general power of resistance and thus create a suitable soil for the development of the disease have already been alluded to. Personally, I am convinced that exposure to dust alone does not account for the undue prevalence of tuberculosis in certain occupations, and that every factor which undermines the general health of the individual is at least of equal if not greater importance in determining the course of the disease. I have therefore arranged in the following tables the percentage distribution of pulmonary tuberculosis in certain occupations in an ascending scale and not according to exposure to the different varieties of dust. I will make such comments as I am able to offer as to the possible influence of physique, standards of living, and the effects of alcohol, lead, mercury, and other industrial poisons.

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<sup>1</sup>Landis, H. R. M., Jour. of Ind. Hyg., July, 1919, p. 125.

TABLE I.—Occupational mortality statistics; per cent distribution, with special reference to tuberculosis.

Occupations.	Number of deaths.	Tuber- culosis.	Pneu- monia.	Other respira- tory diseases.	Heart diseases.	Diseases of digestive system.
All occupations:		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Male.....	210,507	14.8	8.0	2.2	11.9	2.8
Female.....	27,459	21.0	7.0	2.2	10.3	3.6
Lumbermen and raftsmen.....	815	5.6	6.3	.6	9.0	2.2
Coal miners <sup>1</sup> .....	1,557	5.8	10.4	1.1	9.6	-----
Bankers.....	712	5.9	10.8	1.0	12.1	2.5
Manufacturers and officials.....	2,805	6.3	7.2	2.0	13.2	3.5
Farmers, planters, and overseers.....	34,662	6.6	6.6	2.1	16.3	3.8
Physicians and surgeons.....	1,421	6.6	7.4	1.8	12.7	3.5
Clergymen.....	1,216	6.6	7.1	2.0	15.5	3.5
Steam-rail employees.....	5,555	7.0	4.3	1.1	5.3	1.3
Lawyers.....	1,325	7.5	7.9	1.9	12.7	3.1
Farmers, planters, and overseers <sup>2</sup> .....	799	7.9	6.9	1.1	14.8	4.0
Officials, Government.....	997	8.6	7.3	1.4	15.3	3.0
Agricultural pursuits:						
Females.....	879	8.6	6.8	3.1	15.1	4.0
Males.....	50,844	8.7	7.1	2.2	15.1	3.5
Foremen and overseers.....	745	8.7	6.8	2.3	11.3	2.6
Watchmen, police, and firemen.....	2,355	8.7	7.9	2.1	14.6	2.1
Miners and quarrymen.....	5,663	8.8	8.2	4.3	7.1	2.0
Hotel keepers.....	765	9.3	6.8	1.7	11.2	4.2
Gardeners, florists, and nurserymen.....	1,215	9.3	9.1	3.6	14.7	3.6
Farmers and farm laborers <sup>1</sup> .....	3,890	9.7	6.2	-----	16.5	-----
Stock raisers, herders, and drovers.....	768	9.8	6.8	2.0	12.0	4.0
Merchants and dealers (except wholesale).....	9,329	9.9	7.0	1.9	13.1	3.3

<sup>1</sup> Metropolitan Life Insurance Experience, 1911-1913.<sup>2</sup> Prudential Industrial Insurance Experience.

Table I deals with 21 occupations. The percentage of deaths from tuberculosis ranges from 5.6 in lumbermen and raftsmen to 9.9 in merchants and dealers. The percentage of 5.8 in coal miners, based upon the experience of the Metropolitan Insurance Co. in 1,557 deaths, is quite low as compared with 9.7 per cent given by the Prudential Co. in 3,658 deaths, and 9.2 per cent as given by Hayhurst<sup>1</sup> based upon 5,428 deaths among Illinois soft-coal miners from 1912 to 1918.

Dr. Hayhurst in his excellent discussion of the subject invites attention to the fact that the marked excess in deaths due to violence in mining operation nullifies to a large extent any comparison possible between the other causes of deaths. When, in the case of miners, he omitted violence as a cause of death and then compared the purely medical causes (with suicide included), he found the percentage of deaths from tuberculosis to be 14.6.

Dr. William H. Davis, the chief statistician for vital statistics of the United States Bureau of Census, cautioned me at the outset of these studies that a proper interpretation of mortality percentage figures by age and occupation can only be made by constantly keeping in mind the normal death rates of the various occupations and ages. For example, a low percentage from tuberculosis may not

<sup>1</sup> Hayhurst, Emery R., The Health Hazards and Mortality Statistics of Coal Mining in Illinois and Ohio: Jour. of Ind. Hyg., November, 1919.

mean an actually lower rate from this disease, but may mean that there is an unusually high rate from accidents or some other cause. The violence percentage in steam-railway employees was 53.6, and in lumbermen and raftsmen 29.9; and this accounts for their remarkably low percentage of deaths from tuberculosis in this table, and also for the low percentage in miners and quarrymen.

This table shows, however, quite clearly that tuberculosis is infrequent in occupations involving out-door life combined with muscular activity; but it also shows that it is infrequent in the liberal professions, among bankers, officials, hotel keepers, and shop keepers, presumably because of higher standards of living.

TABLE II.—Occupational mortality statistics, per cent distribution.

Occupations.	Number of deaths.	Tuber- culosis.	Pneu- monia.	Other respira- tory diseases.	Heart diseases.	Diseases of digestive system.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Commercial travelers.....	542	10.0	5.2	1.2	9.8	3.9
Carpenters and joiners.....	7,883	10.1	7.1	2.0	14.4	2.7
Puddlers <sup>1</sup> .....	251	10.4	6.2	-----	16.5	-----
Agents.....	2,625	10.4	7.7	1.0	13.0	2.8
Boatmen and sailors.....	1,757	10.4	7.4	1.7	10.0	1.6
Cabinetmakers.....	632	10.9	5.5	2.9	12.3	3.0
Nurses and midwives.....	915	11.1	7.8	1.6	11.4	3.6
Railway track and yard workers <sup>2</sup> .....	1,932	11.1	6.4	1.3	12.0	-----
Blacksmiths.....	2,456	11.4	8.0	2.5	13.8	3.1
Professional service, male.....	9,214	12.0	7.3	1.0	12.3	2.9
Housewives and housekeepers <sup>2</sup> .....	88,151	12.0	6.0	1.4	15.3	-----
Engineers and firemen, not locomotive.....	3,295	12.6	7.7	1.9	11.8	2.5
Boot and shoe makers and repairers.....	2,702	13.4	8.5	2.5	13.7	2.2
Coopers.....	570	13.7	8.9	4.4	12.6	2.3
Iron-ore miners.....	563	13.7	7.6	9.6	-----	-----
Janitors and sextons.....	1,065	13.9	12.6	1.8	13.0	2.5
Masons, brick and stone.....	2,399	13.9	8.2	2.5	13.2	2.3
Railway engineers and trainmen <sup>1</sup> .....	947	14.0	5.1	-----	5.4	-----
Agricultural laborers.....	13,214	14.5	8.4	2.2	12.6	2.8

<sup>1</sup> Prudential Industrial Insurance Experience.

<sup>2</sup> Metropolitan Life Insurance Experience, 1911-1913.

Table II deals with 19 occupations. The percentage of deaths from tuberculosis ranges from 10 in commercial travelers to 14.5 in agricultural laborers. The percentage in the latter group appears high when compared with 8.7 per cent in 50,844 persons engaged in other agricultural pursuits, unless accounted for by lower standards of living. It is rather remarkable that the percentage of tuberculosis in carpenters and cabinetmakers, exposed as they are to a mixture of vegetable and mineral dust in sandpapering, should be about the same as that in commercial travelers. We note, however, that the percentage of deaths from digestive diseases in the latter group is quite high, possibly indicating a lower state of nutrition. The percentages in all the other occupations enumerated in this table are below 14.8, which is the average for all occupations, in spite of the fact that a number of them are dusty trades.

TABLE III.—Occupational mortality statistics, per cent distribution.

Occupations.	Number of deaths.	Tuber- culosis.	Pneu- monia.	Other respira- tory diseases.	Heart diseases.	Diseases of digestive system.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Teachers and professors (college, male)....	587	15.0	5.6	1.7	12.6	4.3
Saloon keepers.....	973	15.5	8.5	1.6	7.3	2.9
Manufacturers, mechanical pursuits.....	63,880	15.5	7.9	2.4	11.4	2.6
Salesmen.....	2,550	15.8	7.6	1.0	11.5	2.8
Butchers.....	1,503	16.2	8.3	1.2	12.0	2.8
Iron and steel workers.....	2,838	16.3	10.8	1.5	10.0	2.5
Trade and transport workers.....	44,941	16.6	7.3	1.6	10.2	2.5
Plasterers <sup>1</sup> .....	977	16.7				
Bakers.....	952	18.2	8.6	1.9	10.8	2.5
Hucksters and peddlers.....	799	18.3	9.5	2.1	10.8	2.4
Machinists.....	3,317	18.3	7.9	1.9	11.1	2.4
Domestic servants and laundresses (female).....	1,091	18.5	8.7	2.6	11.5	3.9
Domestics, personal service (female).....	17,735	18.7	7.5	2.3	10.6	3.7
Street-railway employees.....	697	18.9	6.2	1.3	6.3	1.4
Painters, glazers, and varnishers.....	3,720	18.9	8.0	1.7	10.6	2.4
Tin-plate and tinware workers.....	681	18.9	8.2	2.5	11.6	2.9
Tailors.....	2,408	19.0	7.7	3.5	10.5	3.0
Dressmakers.....	1,019	19.2	7.0	1.3	11.7	2.9
Servants and waitresses.....	14,930	19.5	7.3	2.3	10.4	3.7
Professional service (female).....	1,725	19.7	6.9	1.8	8.8	3.5
Domestic and personal service (male).....	41,624	19.7	10.2	2.2	10.4	2.5
Laborers, not specified.....	29,345	19.9	11.0	2.4	10.1	2.5

<sup>1</sup> Prudential Industrial Insurance Experience, 1911-1913.

Table III includes 22 occupations. The percentage of deaths from tuberculosis varies from 15 in college professors and teachers to 19.9 in day laborers. The percentage in female college professors and teachers is 21.5. Both are usually recruited from weak stock, and the high percentage of diseases of the digestive organs in both sexes is indicative of a low state of nutrition. The rates suggest the need of improvement in personal hygiene and the sanitation of classrooms. The percentage in saloon keepers is 15.5, as compared with 9.3 in hotel keepers, and 26 per cent in innkeepers and bartenders. The conclusion seems irresistible that chronic alcoholism plays an important rôle in the latter group. Butchers and steel workers have about the same percentage in tuberculosis, but the steel workers have a higher pneumonia rate. Butchers have a high venereal rate and are often alcoholic. In painters and tinware workers the element of chronic lead poisoning should be considered. The percentage of deaths from tuberculosis in tailors and dressmakers is almost the same. Exposure to a mixture of vegetable and animal dust and a postural influence may be discerned, since finishers (among males) show the greatest percentage of faulty postures. The rates for servants and laborers are above the average and are doubtless influenced by exposure to dust and also by alcohol.

TABLE IV.—Occupational mortality statistics, per cent distribution.

Occupations.	Number of deaths.	Tuber- culosis.	Pneu- monia.	Other respira- tory diseases.	Heart diseases.	Diseases of digestive system.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Engravers <sup>1</sup> .....	112	20.5	2.7	0.9	.....	.....
Hostlers.....	540	20.6	13.9	.8	12.2	2.0
Cotton-mill operatives.....	686	21.1	6.9	2.0	11.5	3.5
Textile-mill workers <sup>2</sup> .....	2,390	22.0	5.9	.....	10.7	.....
Teachers and professors (college, female).....	1,170	21.5	8.0	1.6	8.4	3.5
Painters and paper hangers <sup>2</sup> .....	2,722	21.9	6.1	.....	10.7	.....
Iron molders <sup>2</sup> .....	1,646	21.9	10.6	.....	13.1	.....
Bookkeepers and accountants.....	1,740	22.5	6.1	1.5	12.5	2.2
Musicians and teachers of music.....	509	23.4	6.8	1.9	11.0	2.5
Draymen, hackmen, and teamsters.....	5,791	23.4	9.2	1.7	9.6	2.2
Barbers and hairdressers.....	1,398	23.9	6.2	1.4	10.7	2.5
Electricians.....	776	24.1	6.8	1.0	5.4	1.3
Seamstresses.....	695	24.2	6.9	2.4	10.2	4.5
Tobacco and cigar operatives.....	982	24.3	6.1	1.7	10.1	2.3
Machinists <sup>2</sup> .....	3,152	25.0	7.1	.....	11.1	.....

<sup>1</sup> Prudential Industrial Insurance Experience.<sup>2</sup> Metropolitan Life Insurance Experience, 1911-1913.

Table IV includes 15 occupations with a percentage of deaths varying from 20.5 in engravers to 25 per cent in machinists. Steel engravers are exposed to mercury, electricians to lead and mercury, and painters and machinists (in certain processes) to lead. In the case of textile workers, bookkeepers, accountants, teachers, musicians, and tobacco workers it is fair to assume that the majority are recruited from feeble stock, as shown by very high rates before the completion of the twenty-fifth year. In some of these industries, notably in the textile mills and tobacco factories, special investigations should be made as to the character of dust and whether or not tubercle bacilli are found. Heucke<sup>1</sup> claims to have found 0.56 per cent of nicotine in the dust of different tobacco establishments.

Barbers and hairdressers are frequently exposed to droplet infection and also to inhalation of fine hair. The percentage of deaths from tuberculosis in hostlers is 20.6 and from pneumonia 13.9, as compared with 9.8 and 6.8 in stock raisers, herders, and drivers. Inasmuch as the pneumonia rate among cavalry troops is quite generally in excess of other arms of the service, it occurred to me during my Army experience that the inhalation of the peculiar character of dust given off during the grooming of horses might be a factor in this increased susceptibility. The high rates in draymen, hackmen, and teamsters are usually attributed to exposure to weather without opportunity for active exercise; they have, however, also a high rate for alcoholism. In Great Britain the percentage in private coachmen is much lower, probably because of better habits and living conditions. Iron molders have a high rate of alcoholism and are more or less exposed to dust and also to carbon monoxide.

<sup>1</sup> Cited by Stephani. Weyls Handb. der Arbeiterkrankheiten. Jena, 1908, pp. 634-635.

TABLE V.—Occupational mortality statistics, per cent distribution.

Occupations.	Number of deaths.	Tuber- culosis.	Pneu- monia.	Other res- pira- tory diseases.	Heart diseases.	Diseases of digestive system.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Saloon keepers and bartenders <sup>1</sup> .....	2,190	26.0	8.7	.....	8.3	.....
Manufacturing and mechanical pursuits (female).....	4,582	27.4	6.1	1.3	10.3	2.9
Servants and waiters.....	3,017	27.6	8.0	1.8	10.3	2.4
Dressmakers and garment workers <sup>1</sup> .....	2,172	27.8	5.7	.....	12.6	.....
Bartenders.....	1,115	27.9	11.0	1.6	8.3	2.3
Teamsters, drivers, and chauffeurs <sup>1</sup> .....	6,471	28.2	8.5	.....	9.7	.....
Clerks and copyists.....	7,384	28.3	7.3	1.6	8.6	2.1
Porters and helpers in stores.....	1,253	28.3	11.7	2.3	10.8	2.3
Marble and stone cutters.....	822	<sup>2</sup> 28.6	<sup>2</sup> 7.9	<sup>2</sup> 4.2	10.0	1.0
Plumbers, gas and steam fitters.....	1,178	29.2	8.7	1.6	9.3	2.6
Printers, lithographers, and pressmen.....	1,490	29.2	7.5	1.6	9.0	2.2
Longshoremen and stevedores <sup>1</sup> .....	651	29.2	8.3	.....	12.6	.....

<sup>1</sup> Metropolitan Life Insurance Experience 1911-1913.<sup>2</sup> Prudential Industrial Insurance Experience 1909-1913. (Reduces in 1914-1918 to 23.5 per cent, 7 per cent and 2.3 per cent.)

Table V includes 12 occupations, and the percentage of deaths from tuberculosis varies from 26 in saloon keepers and bartenders to 29.2 in longshoremen and stevedores. In both of these widely differing occupations, as also in teamsters, drivers, and chauffeurs, the influence of alcohol is apparent. My impression is that chauffeurs, if placed in a separate class, would probably show a lower percentage, as they are usually men of good stock and habits. They are, however, frequently exposed to carbon-monoxide poisoning.

The high percentage of 27.6 in male servants and waiters, against a percentage of 19.5 in female servants and waitresses, may be accounted for by the percentage of alcoholism, which was 0.2 in females and 1.8 in male servants. Females on the other hand, have a much higher rate from tuberculosis than males in the manufacturing and mechanical pursuits, or those engaged as bookkeepers and accountants, clerks and copyists, and garment workers. The high percentage in porters and helpers in stores may, in part, be accounted for by exposure to a mixed variety of dust, and possibly infected dust. Their rate for alcoholism is, however, far above the average. The high percentage in marble and stone cutters is doubtless influenced by exposure to mineral dust.

The percentage of tuberculosis in plumbers, gas and steam fitters, and in the printing industry are exactly the same. The influence of a subtle form of lead poisoning is apparent in both occupations, but appears to be more pronounced in plumbers. While it is true that many men of feeble stock enter the printing trades, the same can not be said of plumbers, gas and steam fitters. Alcoholism is charged with a percentage of 1.1 in printers, and 0.9 in plumbers.

TABLE VI.—Occupational mortality statistics, per cent distribution.

Occupations.	Number of deaths.	Tuber- culosis.	Pneu- monia.	Other respira- tory diseases.	Heart diseases.	Diseases of digestive system.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Trade and transportation (female).....	2,538	30.9	5.4	1.5	7.7	3.7
Brass workers <sup>1</sup> .....	201	31.8	9.0	2.0	.....	.....
Clerks and copyists (females).....	844	31.9	6.2	1.2	6.4	3.6
Metal polishers and buffers <sup>1</sup> .....	242	31.9	12.9	.....	12.9	.....
Textile workers (female) <sup>2</sup> .....	1,742	35.5	4.1	.....	8.8	.....
Store clerks and saleswomen <sup>2</sup> .....	794	38.7	3.9	.....	7.7	.....
Clerks, bookkeepers, and office assistants (female) <sup>2</sup> .....	1,235	42.4	3.6	.....	8.1	.....

<sup>1</sup> Prudential Industrial Insurance Experience.<sup>2</sup> Metropolitan Life Insurance Experience, 1911-1913.

Table VI includes 7 occupations; and the percentage of deaths from tuberculosis varies from 30.9 in females engaged in trade and transportation (as compared with 16.6 in males) to 42.4 in female clerks, bookkeepers, and office assistants (as compared with 22.5 in men). Lead and mixed mineral and metallic dust doubtless play a rôle in the mortality in brass workers, metal polishers and buffers. The percentage from tuberculosis in female textile workers is 35.5 against 21.1 in males. The percentage in clerks and saleswomen is 38.7 (as compared with 15.8 per cent in salesmen). The questions of physique, race, and nationality, and many other factors doubtless influence these differences.

TABLE VII.—Percentage of deaths from tuberculosis in certain occupations, based upon the industrial experience of the Prudential Insurance Co. of America, 1907-1912.

Occupations.	Total deaths.	Tuber- culosis.	Occupations.	Total deaths.	Tuber- culosis.
		<i>Per cent.</i>			<i>Per cent.</i>
Furnace tenders in steel works.....	62	6.5	Weavers.....	587	34.7
Coal miners.....	3,658	9.7	Cigar makers.....	.....	36.1
Street cleaners.....	197	12.9	Glass blowers.....	197	36.3
Brick and tile makers.....	133	12.0	Printers.....	1,733	37.3
Slaters.....	93	13.7	Hatters.....	529	36.6
Quarry workers.....	149	14.8	Glass cutters.....	220	36.4
Blacksmiths <sup>1</sup> .....	1,273	14.8	Tanners.....	192	37.2
Heaters in steel plants.....	5	15.7	Polishers and grinders (iron and steel).....	136	37.5
Rollers.....	112	17.9	Stonecutters.....	616	37.6
Miscellaneous employment in steel plants.....	68	20.6	Copper miners.....	611	37.9
Cement-lime workers.....	222	20.7	Lithographers.....	325	38.3
Knitting-mill employees.....	103	22.1	Granite-stone cutters.....	204	39.2
Laborers in iron-steel plants.....	2,788	22.5	Jewelers.....	361	42.3
Iron-steel workers.....	1,341	22.6	Spinners.....	144	42.5
Street car employees.....	1,088	25.7	Polishers and grinders (iron and steel).....	138	42.9
Stove mounters and grinders.....	.....	27.9	Sheffield metal grinders.....	2,640	43.0
Draymen and teamsters.....	9,799	29.4	Brass workers.....	95	43.7
Core makers.....	357	29.4	Silk weavers.....	137	44.5
Artificial-flower makers (male).....	13	30.8	Polishers and finishers in brass.....	143	45.2
Glass workers.....	336	30.9	Tile makers.....	62	45.3
Gold-leaf beaters.....	53	32.0	Lead and zinc ore miners.....	96	49.0
Pressmen.....	224	32.6	Lace workers.....	31	49.2
Carpet weavers.....	101	32.7	Slate-pencils workers <sup>2</sup> .....	280	64.2
Coachmen.....	337	33.1	Flint knappers and buhrstone dressers <sup>2</sup> .....	.....	77.8
Upholsterers.....	400	33.6			
Painters.....	1,056	34.1			
Shoe-factory employees.....	.....	34.5			
Potters.....	267	34.6			

<sup>1</sup> Metropolitan Life Ins. Co.<sup>2</sup> German and English (Hoffman).



Table VII covers 52 industries or occupations, which, because not specifically enumerated in the foregoing tables or because of differences in percentage, are here presented. With few exceptions the data are based upon the experience of the Prudential Insurance Co. or collected by Dr. F. L. Hoffman.<sup>1</sup>

Many of these occupations have already been commented upon. The low figures for furnace tenders in steel plants may be due to a more rapid labor turnover. Puddlers are recruited from a very sturdy stock. Coremakers are exposed not only to dust, but also to carbon monoxide from open wood or coke fires or red-hot cast-iron stoves. Artificial flower makers were formerly exposed to lead and arsenite of copper; aniline colors have replaced to a great extent the latter coloring agent. Gold-leaf workers have also, in Europe, a very high mortality rate from respiratory diseases. It is possible that the copper and zinc contained in the alloy may exert a toxic effect. Carpet weavers, upholsterers, weavers, hatters, tanners, spinners, silk weavers and lace workers show a mortality percentage which is double and, in some instances, more than treble, the average for all occupations. The rate for tanners is unusually high, as the occupation calls for strength and endurance. The handling of the dry hides involves inhalation of more or less dust of an animal and inorganic origin, and fragments of hair. In certain of the tanning and dressing processes there is exposure to disulphide of arsenic, chromates, lead, benzene, and amyl acetate. The rate for hatters is also very high, and can not be wholly attributed to the volume or the character of the dust; indeed some of the processes are carried on in a dust-free atmosphere. It has been held for some time that the chief danger in this industry is exposure to the inhalation of nitrate of mercury which is employed in the carrotting process, and which, in the opinion of Dr. Legge,<sup>2</sup> forms an insoluble compound with the keratine in the hair and is not removed in the subsequent process of the felt-hat industry. The men who make the solution and those who apply it are exposed not only to mercurial, but also to nitrous fumes, and all others engaged in certain dusty processes are exposed to the inhalation of dust impregnated with particles of nitrate of mercury. The stovers, who handle the hard felt shapers at a temperature of 180° F. in the drying department are exposed not only to mercurial vapors, but also in some establishments to the fumes of wood alcohol, employed in the shellacking process to stiffen the hats, which doubtless exerts a toxic effect on the system. There is also danger in some establishments from arsenical poisoning, since, according to Heinzerling and Lewin,<sup>3</sup> the fleshy part of hare and rabbit skins is not infrequently treated with a soap containing arsenite of potassium or sodium.

<sup>1</sup> Hoffman, Frederick L., Mortality from Respiratory Diseases in Dusty Trades: Bull. U. S. Bureau of Labor Statistics, No. 231. June, 1918.

<sup>2</sup> Legge, Thomas M. *Oliver's Dangerous Trades*.

<sup>3</sup> Cited by Schütte. Weyl's Handb. der Arbeiterkrankheiten, Jena, 1908, p. 386.

The excessive rates in glass workers, potters, file makers, and brass workers are likewise influenced not only by the character of the dust, but by exposure to lead. The rates for copper miners, and lead and zinc ore miners are also very high. This may be due to the high percentage of crystalline silica content in the dust of some of the mining districts; but since the percentage of deaths is very much lower in gold quartz miners, we strongly suspect that lead and copper may exert a toxic effect on the system in this class of miners.

The percentage for slate-pencil workers is exceedingly high. They are quoted by Hoffman from Sommerfeld and apply to a class of workers whose physical and social economic conditions are notoriously low; one-third of the workers were children below the age of 14. The mortality from tuberculosis is also high for slate workers in Wales. A British commission found that pure slate dust was rarely met with, but as a rule the dust included a considerable proportion of minute particles of adherent quartz.

The percentage of tuberculosis in lace workers is very high; in Great Britain it is somewhat below the average. It is quite possible that the dust inhaled during the making of linen lace is more injurious, because Greenhow, as early as 1865, has shown that flax dust contains silica. Excessive heat and humidity are injurious factors in some of the departments, and according to Arlidge, exposure to coal gas from gas-heated stoves in the process of "gauffering" is not infrequent. There is likewise danger from lead poisoning in workers in lace and silk weighted with lead acetate.

TABLE VIII.—Average age at death, by occupation.<sup>1</sup>

MALE.		Average age at death.
Bookkeepers and office assistants.....		36.5
Enginemen and trainmen (railway).....		37.4
Plumbers, gas fitters, and steam fitters.....		39.8
Compositors and printers.....		40.2
Teamsters, drivers, and chauffeurs.....		42.2
Saloon keepers and bartenders.....		42.6
Machinists.....		43.9
Longshoremen and stevedores.....		47.0
Textile-mill workers.....		47.6
Iron molders.....		48.0
Painters, paper hangers, and varnishers.....		48.6
Cigar makers and tobacco workers.....		49.5
Bakers.....		50.6
Railway track and yard workers.....		50.7
Coal miners.....		51.3
Laborers.....		52.8
Masons and bricklayers.....		55.0
Blacksmiths.....		55.4
Farmers and farm laborers.....		58.5
All occupations.....		47.9

<sup>1</sup> Based upon the Experience of the Metropolitan Insurance Co. Industrial Department, 1911-1913, by Statistician Louis I. Dublin, Ph. D.

	Average age at death.
FEMALE.	
Clerks, bookkeepers, and office assistants.....	26.1
Store clerks and saleswomen.....	28.0
Textile-mill workers.....	33.9
Dressmakers and garment workers.....	42.0
Domestic servants.....	49.1
Housewives and housekeepers.....	53.3
<hr/>	
All specified occupations.....	51.1

Fortunately, the effects of legislation and factory sanitation, together with the gospel of personal hygiene and higher standards of living conditions, which have been emphasized in the educational campaign against the great white plague, are strikingly shown by a most marked decrease in the mortality from tuberculosis in 8 of the so-called dangerous trades in the State of New Jersey.

Dr. F. S. Crum, assistant statistician of the Prudential Insurance Co., has kindly furnished me with data relating to occupations in the State of New Jersey. The table shows that the percentage of mortality from tuberculosis in hatters has been reduced from 29.7 in the period of 1909-1913 to 23.6 in the period of 1914-1918; the pneumonia rate during the same period has been reduced from 8.5 to 7, and other respiratory diseases from 4.9 to 2.3. In stone cutters the percentage of deaths from tuberculosis during the same period has been reduced from 26.3 to 19.7; in metal grinders, from 39.2 to 29.1; in molders, founders, and casters, from 19.7 to 17.4; in other iron and steel workers, from 24 to 17.2, and in plumbers, from 32.5 to 22.6. There was no decrease in the textile industry, the rate in the period 1909-1913 being 21.3, and in 1914-1918 21.7 per cent.

In potters there was an increase in the percentage of tuberculosis from 32.4 (1907-1913) to 36.6 during the period from 1914-1918. This increase, fortunately, does not indicate an increased hazard, for by reference to the tables it will be noted that there was a distinct decrease at ages between 10 and 39, showing that the protective measures are really effective in all newcomers, but that they could not avert the damage inflicted in the older workers before the adoption of the present safeguards.

TABLE IX.—*Proportionate mortality in specified industries from tuberculosis of the lungs, New Jersey, 1909-1918.*

## HATTERS.

Ages.	1909-1913			1914-1918			
	Deaths from—		Per-centage, (B) of (A).	Deaths from—		Per-centage, (B) of (A).	Per cent increase or decrease.
	All causes (A).	Tuber-culosis of the lungs (B).		All causes (A).	Tuber-culosis of the lungs (B).		
10-19.....	3	2	66.7	27	8	29.6	— 55.6
20-29.....	44	28	63.6	65	22	33.8	— 46.9
30-39.....	69	49	71.0	74	23	31.1	— 56.2
40-49.....	117	42	35.9	84	27	32.1	— 10.6
50-59.....	102	16	15.7	88	28	31.8	+102.5
60 and over.....	150	7	4.7	134	3	2.2	— 53.2
Total (ages 10 and over) ..	485	144	29.7	472	111	23.5	— 20.9

## TEXTILE INDUSTRIES.

10-19.....	75	31	41.3	85	23	27.1	—34.4
20-29.....	183	84	45.9	226	76	33.6	—26.8
30-39.....	159	48	30.2	245	89	36.3	+20.2
40-49.....	189	36	19.0	209	52	24.9	+31.1
50-59.....	161	20	12.4	223	34	15.2	+22.6
60 and over.....	298	8	2.7	550	12	3.6	+33.3
Total (ages 10 and over) ..	1,065	227	21.3	1,518	286	21.7	+ 1.9

## METAL GRINDERS.

10-19.....	4	.....	.....	4	.....	.....	.....
20-29.....	23	14	60.9	39	14	35.9	—41.1
30-39.....	39	19	48.7	66	29	43.9	— 9.9
40-49.....	44	19	43.2	53	17	32.1	—25.7
50-59.....	21	5	23.8	55	13	23.6	— 0.8
60 and over.....	22	3	13.6	44	3	6.8	—50.0
Total (ages 10 and over) ..	153	60	39.2	261	76	29.1	—25.8

## MOLDERS, FOUNDERS, AND CASTERS.

10-19.....	4	1	25.0	4	.....	.....	—100.0
20-29.....	42	16	38.1	45	14	31.1	— 18.4
30-39.....	57	21	36.8	83	18	21.7	— 41.0
40-49.....	65	11	16.9	101	21	20.8	+ 23.1
50-59.....	56	8	14.3	99	15	15.2	+ 5.3
60 and over.....	90	5	5.6	110	9	8.2	+ 46.4
Total (ages 10 and over) ..	314	62	19.7	442	77	17.4	— 11.7

## STONECUTTERS.

10-19.....	2	.....	.....	4	.....	.....	.....
20-29.....	6	2	33.3	17	3	17.6	— 47.1
30-39.....	29	13	44.8	19	5	26.3	— 41.3
40-49.....	39	13	33.3	44	11	25.0	— 24.9
50-59.....	67	19	40.4	51	17	33.3	— 17.6
60 and over.....	67	3	4.5	93	9	9.7	+115.6
Total (ages 10 and over) ..	190	50	26.3	228	45	19.7	— 25.1

TABLE IX.—*Proportionate mortality in specified industries from tuberculosis of the lungs, New Jersey, 1909-1918—Continued.*

## POTTERS.

Ages.	1909-1913			1914-1918			
	Deaths from—		Per-centage, (B) of (A).	Deaths from—		Per-centage, (B) of (A).	Per cent increase or decrease.
	All causes (A).	Tuber-culosis of the lungs (B).		All causes (A).	Tuber-culosis of the lungs (B).		
10-19.....	10	5	50.0	7	1	14.3	— 71.4
20-29.....	50	22	44.0	47	19	40.4	— 8.2
30-39.....	69	39	56.5	72	32	44.4	— 21.4
40-49.....	108	33	30.6	104	47	45.2	+ 47.7
50-59.....	71	20	28.2	105	31	29.5	+ 4.6
60 and over.....	75	5	6.7	72	19	26.4	+294.0
Total (ages 10 and over)...	383	124	32.4	407	149	36.6	+ 13.0

## IRON AND STEEL WORKERS.

10-19.....	35	7	20.0	20	3	15.0	—25.0
20-29.....	148	65	43.9	210	51	24.3	—44.6
30-39.....	264	102	38.6	299	69	23.1	—40.2
40-49.....	242	67	27.7	268	63	23.5	—15.2
50-59.....	220	29	13.2	234	26	11.1	—15.9
60 and over.....	264	11	4.2	287	15	5.2	+23.8
Total (ages 10 and over)...	1,173	281	24.0	1,318	227	17.2	—28.8

## PLUMBERS.

10-19.....	14	1	7.1	28	4	14.3	+101.4
20-29.....	99	51	51.5	162	36	22.2	— 56.9
30-39.....	135	55	40.7	195	54	27.7	— 31.9
40-49.....	118	35	29.7	178	48	27.0	— 9.1
50-59.....	59	11	18.6	123	36	29.3	+ 57.5
60 and over.....	70	8	11.4	115	3	2.6	— 77.2
Total (ages 10 and over)...	495	161	32.5	801	181	22.6	— 30.5

It is less than 15 years since attention has been paid to industrial hygiene in this country; but in view of what has been accomplished during that brief period, I venture to predict that no country will make greater progress in social and industrial betterment than our own beloved United States.

In the meantime no opportunity should be lost in the general campaign to emphasize the importance of personal hygiene and general sanitation; for be it remembered that every movement which makes for better health and a temperate, untainted, and virile race, will offer the best safeguard in the prevention of tuberculosis. When we supply our children with healthful school rooms and teach them the value of pure air, sanitary homes, proper and sufficient food, physical culture, baths and suitable clothing, and the importance of pure, clean lives, the lessons taught will be applied in the homes and workshops of the Nation.